APPENDIX F
ENVIRONMENTAL IMPACT METHODOLOGY

This appendix briefly describes the methods used to assess the potential direct, indirect, and cumulative effects of the alternatives in the *Modern Pit Facility Environmental Impact Statement* (MPF EIS). Included are impact assessment methods for land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and paleontological resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, waste management, and cumulative impacts. Each section includes descriptions of the affected resources, region of influence (ROI), and impact assessment methods.

F.1 LAND USE/VISUAL RESOURCES

F.1.1 Land Use

F.1.1.1 Description of Affected Resources and Region of Influence

The analysis of impacts to land use will consider land use plans and policies, zoning regulations, and existing land use as appropriate for each site analyzed. The potential impacts associated with changes to land use as a result of the alternatives will be discussed.

F.1.1.2 Description of Impact Assessment

Land use changes associated with construction and operation of the MPF could potentially affect both developed and undeveloped land. The analysis of land use will consider impacts that could result from the construction and operation of the MPF on each site. Potential changes in land use, if any, would likely occur within the existing boundaries of the alternative sites. However, the use of lands adjacent to or in the vicinity of U.S. Department of Energy (DOE) sites (i.e., non-DOE land) could be affected by these changes, including new or expanded safety zones.

The degree to which the MPF could affect future use or development of land at each DOE site will be considered. Land use impacts will be assessed based on the extent (relative to the immediate surroundings and the plant site, as a whole) and type of land that would be affected. The land use analysis will also consider potential direct impacts resulting from the conversion of land and/or the incompatibility of land use changes with special status lands such as national parks or monuments, and other protected lands such as Federal- and state-controlled lands (e.g., public land administered by the Bureau of Land Management [BLM] or other government agencies).

F.1.2 Visual Resources

F.1.2.1 Description of Affected Resources and Region of Influence

Visual resources include natural and man-made physical features that give a particular landscape its character and value. The feature categories that form the overall impression a viewer receives

of an area include landform, vegetation, water, color, adjacent scenery, rarity, and man-made (cultural) modifications.

F.1.2.2 Description of Impact Assessment

Criteria used in the visual resources analysis will include scenic quality, visual sensitivity, distance, and/or visibility zones from key public viewpoints. The analysis will be comparative in nature and consist of a qualitative examination of potential changes in visual resources, scenic values (attractiveness), and view corridors (visibility). Aspects of visual modification to be examined will include site development or modification activities that could alter the visibility of structures at each of the alternative sites or obscure views of the surrounding landscape, and changes in land cover that could make structures more visible.

F.2 SITE INFRASTRUCTURE

F.2.1 Description of Affected Resources and Region of Influence

This section describes the impact on Los Alamos National Laboratory (LANL) site infrastructure for the No Action Alternative and the modifications that would be needed for the construction and operation of the MPF Alternative and the TA-55 Upgrade Alternative. These impacts are evaluated by comparing current site infrastructure to key facility resource needs for the No Action, MPF, and TA-55 Upgrade Alternatives.

F.2.2 Description of Impact Assessment

The assessment of potential impacts to site infrastructure, which includes electrical power, fuels, and process gases, addresses whether there is sufficient available and peak capacity to support the MPF Alternative and pit production capacities. Projections of electricity availability, site development plans, and other DOE mid- and long-range planning documents are used to project site infrastructure conditions. Tables are presented that depict the additional infrastructure requirements resulting from the alternatives. Mitigation considerations that could reduce impacts due to changes in infrastructure are identified on a site-by-site basis.

F.3 AIR QUALITY AND NOISE

F.3.1 Nonradiological Air Resources

F.3.1.1 Description of Affected Resources and Region of Influence

The air quality assessment evaluates the consequences of criteria and hazardous/toxic air pollutants associated with each alternative at each candidate site. The criteria pollutants are specified in 40 CFR 50, the U.S. Environmental Protection Agency (EPA) Regulations on National Primary and Secondary Ambient Air Quality Standards. The hazardous/toxic air pollutants are listed in Title III of the 1990 *Clean Air Act* (CAA) Amendments, the National Emissions Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR 61), and standards or guidelines proposed or adopted by the respective states.

Current information on emissions from existing operations and ambient air concentrations will be obtained from each alternative site's information (e.g., site Annual Reports, recent EISs).

F.3.1.2 Description of Impact Assessment

Atmospheric dispersion of pollutant emissions from construction activities (e.g., engine exhaust and fugitive dust emissions), operations, and maintenance activities will be estimated with conventional modeling techniques, such as those included in the EPA's SCREEN3 and Industrial Source Complex Short Term (ISCST) models. The estimated concentrations of these pollutants at facility boundaries will be compared with existing air quality standards for criteria pollutants or with guidelines for pollutants that do not have corresponding standards.

EPA guidelines are conservatively applied in the air quality assessment. The "highest-high" will be selected for comparison to applicable standards and guidelines for all averaging times, instead of the EPA-recommended "highest-high" and "highest second highest" concentration for long-term and short-term averaging times, respectively. The concentrations to be evaluated are the maximum occurring at or beyond the site boundary or public access roads. Chemical release rates and modes (e.g., pounds per year, stack height and velocity) will be defined fro the project alternatives. It will also be assumed that the toxic/hazardous emissions for the alternative sites with incomplete source characteristics originate from a single point source. This assumption generally results in higher concentrations than would actually occur since emission sources are commonly geographically separated from one another.

A more detailed and quantitative assessment will be performed in site-specific *National Environmental Policy Act* (NEPA) documents designed to support a construction-level siting decision. This EIS assessment of impacts from the No Action Alternative and the other alternatives will use a screening level analysis based on conservative assumptions for modeling of potential impacts. The screening level modeling analysis to be presented in the EIS is a programmatic approach intended to provide a comparison of the air quality among each of the alternative sites. Modeled concentrations of air pollutants to be presented in the EIS that exceed the Federal or state air quality standards provide an indication of a potential problem. Detailed modeling and/or monitoring at each site would be required in order to obtain more accurate estimates of pollutant concentrations. The assessment in followon site-specific NEPA documents would be more refined with detailed design, source characteristics, and exact source locations.

Health risks from hazardous chemical releases during normal operation at the respective sites will be assessed. A model such as ISCST or SCREEN3 will be used to assess concentrations to the population, to maximum exposed individuals (MEIs), and to non-involved workers. Hazard Index (HI) values will be used to screen for additional analysis. Site boundary concentrations will be used to develop hazard quotients (HQs) for noncancer risks for comparison to reference concentration values, such as the EPA Integrated Risk Information System. The cancer risk to the maximally exposed individual is calculated from the doses derived from modeling exposure levels, using slope factors or unit risks for individual chemicals published in the Integrated Risk Information System or the health effects summary tables. The health effects summary tables are the yearly summary of EPA's regulatory toxicity data.

The HIs and cancer risks are used to identify potential health concerns that may require further analysis. If the HI and/or cancer risk exceed acceptable limits, then these sites or activities become candidates for further analysis. The in-depth analysis should identify the individual chemicals that contribute to substantial adverse HI and/or cancer risk impacts, starting with those chemicals showing the highest HQs and/or cancer risk and grouping them according to their specific health effects. These chemicals may then be identified for inclusion in more specific site analyses. HIs and/or the cancer risk default values exceeding Occupational Health and Safety Administration (OSHA) standards do not necessarily indicate that a health concern exists. The calculated HIs and cancer risk only establish a baseline for comparison of alternatives among different sites. The baseline is then used to determine the extent to which each alternative adds or subtracts from the No Action Alternative HI and cancer risk to the public at each site.

F.3.2 Radiological Air Resources

F.3.2.1 Description of Affected Resources and Region of Influence

It is expected that radiological impacts from the MPF to workers and surrounding populations will be predominantly via the air pathway. Current information on dose to non-involved workers, MEI, and collective dose to surrounding population due to radiological releases from existing operations will be obtained from each alternative site's information (e.g., site Annual Reports, recent EISs). Impacts from operation of the MPF at each site will be calculated using a model such as GENII or CAP-88.

F.3.2.2 Description of Impact Assessment

The impacts from operation of the MPF at each site are based on a combination of site-specific and technology-specific data. Site-specific data required for modeling include meteorology (e.g., wind speed, wind direction, precipitation), population distribution (for impacts on population), agricultural production (distribution about the release, types and quantity produced), and distances and directions to the fenceline (or other locations at which the public could be exposed; for MEI calculations). All distances and directions (population and agricultural distribution, fenceline) are relative to the assumed location of the MPF at each alternative site.

Operations data required for the calculations include release rates (i.e., curies per year by nuclide) and modes of release (e.g., stack height, stack velocity, diffuse release area). Doses will be calculated for the general population and for non-involved workers (i.e., onsite workers not directly involved in the pit manufacturing operations). The latter will be assumed to be 1,000 meters (m) (3,281 feet [ft]) from the release.

F.3.3 Noise

F.3.3.1 Description of Affected Resources and Region of Influence

Current information on noise from existing operations will be obtained from each alternative site's information (e.g., site Annual Reports, recent EISs).

F.3.3.2 Description of Impact Assessment

The methodology used to determine environmental impacts of the MPF at each of the alternative sites with respect to noise will involve a two-step analysis. The first step will be to identify noise levels associated with construction and operation of the MPF and determine if they are likely to exceed noise levels defining ambient background conditions. If these noise levels could exceed ambient conditions, the analysis will determine whether the impacts are significant, using a qualitative assessment of the increase or decrease in noise level experienced by receptors near the source.

A subjective response to changes in sound levels based upon judgments of sound presented within a short time span indicate that a change of ±5 A-weighted decibels (dBA) may be quite noticeable, although changes that take place over a long period of time of this magnitude or greater may be "barely perceptible." Changes in sound levels of ±10 dBA within a short time span may be perceived as "dramatic" and changes in sound levels of ±20 dBA within a short time span may be perceived as "striking." Dramatic or striking changes in sound level could be considered significant impacts.

F.4 WATER RESOURCES

F.4.1 Surface Water

F.4.1.1 Description of Affected Resources and Region of Influence

Surface waters include rivers, streams, lakes, ponds, playas, and reservoirs. An inventory of surface water resources in the project ROI, a description of areas in the ROI currently using surface water, general flow characteristics, reservoirs, and an identification of classifications applicable to the surface water will be used to determine the affected environment at each alternative site. Emphasis will be placed on those waterbodies that have the potential to be impacted during the facility's operations over the timeframe analyzed. Current wastewater treatment facilities and discharges also will be described as a baseline.

The affected environment descriptions for water quality of potentially affected receiving waters for each site will be developed by reviewing current monitoring data to identify parameters that exceed water quality criteria. Monitoring reports for discharges permitted under the National Pollutant Discharge Elimination System (NPDES) program and state regulations will be examined for exceeding permit limits or requirements. In addition, surface water quality will be evaluated in terms of whether the water body supports the designated use assigned by the individual states under the *Clean Water Act* (CWA).

F.4.1.2 Description of Impact Assessment

The assessment of potential water quality impacts will include evaluation of the type (wastewater effluent), rate, and potential discharge constituents. Environmental consequences may result if: (1) the surface water flow rate is decreased to the point where the capacity of the receiving waterbody to assimilate discharges is noticeably diminished; (2) the proposed increases in discharge cannot comply with NPDES permit limits on flow rates; (3) the proposed increases in discharges contribute to receiving waters already identified as exceeding applicable surface

water quality criteria; or (4) the proposed increases in effluent cannot comply with pre-treatment limits on flow rates or specific constituent contributions without additional treatment. In addition, any expected increases in surface water runoff will be discussed along with the potential impact to surface water features at each site.

F.4.2 Groundwater

F.4.2.1 Description of Affected Resources and Region of Influence

As part of the affected environment section of the EIS, groundwater will be described in terms of the local aquifers' extent and yield, thickness, EPA classification, and recharge and discharge areas for each site. Areas in the ROI currently experiencing groundwater overdraft and related problems, and areas that have experienced large water table declines, will be described if applicable. Current potable and process water supplies and systems, water rights agreements, and water allocation of the site areas also will be described. The latest environmental data, including maps, reports, and other literature, will be used to the maximum extent possible to evaluate these conditions.

The affected environment groundwater quality at the site will be evaluated by reviewing current monitoring data and identifying any parameters that exceed state water quality standards, drinking water standards, and DOE-derived concentration guides for radionuclides in water. Parameters that exceed water quality criteria will be further described and contaminant plumes delineated, where possible.

F.4.2.2 Description of Impact Assessment

An assessment of potential groundwater quality environmental consequences will be associated with pollutant discharges during facility modification and operation phases (e.g., process wastes and sanitary wastes) and will be examined for each site to determine if a direct input to groundwater could occur. The results of the groundwater quality projections will then be discussed relative to Federal and state groundwater quality standards, effluent limitations, and safe drinking water standards to assess the acceptability of each alternative. Operation parameters from the alternatives with the potential to further degrade existing groundwater quality will be identified.

The potential effects to groundwater availability will be assessed for each alternative at each candidate site by evaluating whether the proposed project: (1) increases groundwater withdrawals in areas already experiencing overdraft and other related problems (e.g., land subsidence); (2) potentially decreases groundwater levels causing a substantial depletion of the resource; (3) water requirements exceed the allotment, water rights, or available supply limits, if present; or (4) reduces or ceases the flow of one or more major springs. Suitable mitigation measures to reduce impacts will be identified and discussed.

F.4.3 Floodplains

Floodplains include any lowlands that border a stream and encompass areas that may be covered by the stream's overflow during flood stages. As part of the affected environment discussion at each site, floodplains will be identified from maps and environmental documents. Any potential

facility location within a 100-year floodplain or a critical action in a 500-year floodplain would be assessed for environmental consequence. The 500-year floodplain evaluation is of concern for activities determined to be critical actions for which even a slight chance of flooding would be intolerable. Appropriate mitigation measures would be identified to minimize potential floodplain impacts.

F.5 GEOLOGY AND SOILS

F.5.1 Description of Affected Resources and Region of Influence

The analysis of geology and soils examines the ROI, or lands occupied by and immediately surrounding each alternative site. Information on the regional structural geology, stratigraphy, and soils will be collated and summarized.

In addition, the seismicity of the region surround each site will be evaluated to provide a perspective on the probability of earthquakes in the area and their likely severity. This information will used to provide input to the evaluation of accidents due to natural phenomena.

F.5.2 Description of Impact Assessment

The proposed project areas being evaluated at each site will be evaluated for the amount of disturbance that may affect the geology and/or soils of the areas under study. These impacts may include, among others, potential erosion impacts and impacts to potential geologic economic resources. Impacts, if any, will be evaluated and a determination made as to severity. Possible mitigation will also be identified for adverse impacts.

F.6 BIOLOGICAL RESOURCES

F.6.1 Description of Affected Resources and Region of Influence

Biological resources will be described within the ROI, which is defined by the lands occupied by and immediately surrounding each alternative site. In the case of threatened and endangered species and other special interest species, biotic information will include species distribution within the county of each alternative site location. Information on biological resources will be complied, collated and summarized from existing documentation. No site-specific biological surveys will be conducted. Site-specific quantitative analyses would be performed in support of follow-on site- and project-specific NEPA analysis. Descriptions will be at a summary level and focus within four categories: Terrestrial Resources, Wetlands, Aquatic Resources, and Threatened and Endangered Species.

F.6.2 Description of Impact Assessment

During construction, impacts to biotic resources, including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species, may result from land-clearing activities, erosion and sedimentation, and human disturbance and noise. Operations may affect biotic resources as a result of changes in land use, emission of radionuclides, water withdrawal, wastewater discharge, and human disturbance and noise. In general, potential impacts will be assessed based on the degree to which various habitats or species could be effected by an

alternative. Where appropriate, impacts will be evaluated with respect to Federal and state protection regulations and standards.

The analysis of impacts of MPF project alternatives to biological resources will be addressed at a level that is appropriate to the specificity of available information. In general, the analysis of impacts to biological resources presented in the MPF EIS will be qualitative rather than quantitative. Quantitative analyses would be performed in follow-on site- and project-specific NEPA documentation.

Terrestrial Resources

Impacts of the MPF proposed alternatives on terrestrial plant communities will be evaluated by comparing data on site vegetation communities to proposed land requirements for construction and operation. The analysis of impacts to wildlife is based to a large extent on plant community loss or modification, which directly affects animal habitat. The loss of important or sensitive habitats and species is considered more important than the loss of regionally abundant habitats or species. Impacts on biotic resources from the release of radionuclides will not be evaluated. Radiological releases associated with the various alternatives would generally be at or below natural background levels and would be within limits established to protect workers and the public. Since humans have generally been shown to be the most sensitive organism to radiation release, radiological levels should also be protective of biota.

Wetlands

The potential direct loss of wetlands resulting from construction and operation of the proposed MPF will be addressed in a way similar to the evaluation of impacts on terrestrial plant communities; that is, by comparing data on site or area wetlands to proposed land requirements. Sedimentation impacts will be evaluated based on the proximity of wetlands to the MPF project area. Impacts resulting from wastewater discharge into a wetland system will be evaluated, recognizing that effluents would be required to meet applicable Federal and state standards.

Aquatic Resources

Impacts to aquatic resources resulting from sedimentation and wastewater discharge will be evaluated as described for wetlands. Potential impacts from radionuclides will not be addressed for the same reasons described for terrestrial resources.

Threatened and Endangered Species

Impacts on threatened and endangered species and other special interest species will be determined in a manner similar to that used to describe terrestrial and aquatic resources since the sources of potential impacts are similar. A list of species potentially present on each candidate site or in proximity to the candidate site or area will be developed using information obtained from the U.S. Fish and Wildlife Service (USFWS) and appropriate state agencies databases. This list, along with consideration of site environmental and engineering data, and provisions of the *Endangered Species Act*, will be used to evaluate whether the various MPF siting alternatives could impact any threatened or endangered plant or animal (or its habitat).

F.7 CULTURAL AND PALEONTOLOGICAL RESOURCES

F.7.1 Description of Affected Resources and Region of Influence

Cultural resources are those aspects of the physical environment that relate to human culture and society, and those cultural institutions that hold communities together and link them to their surroundings. For this EIS, cultural resources are divided into three general categories: prehistoric resources, historic resources, and Native American resources. A cultural resource can fall into more than one of these categories due to use through a long period of time or multiple functions.

Prehistoric resources are material remains, structures, and items used or modified by people before the establishment of a European presence in the area. By definition, these resources pre-date written records. Historic resources include the material remains and landscape alterations that have occurred since the arrival of Europeans to the area. Due to the focus of this EIS on DOE facilities, historic resources often include resources associated with the Manhattan Project, World War II, and the Cold War. Native American resources are material remains, locations, and natural materials important to Native Americans for traditional religious or heritage reasons. These resources are rooted in the community's history or are important in maintaining cultural identity.

Paleontological resources are the physical remains, impressions, or traces of plant or animal species that date to former geological epochs or the early Holocene. These resources may be sources of information on ancient environments and the evolutionary development of plants and animals.

The ROI for the cultural and paleontological resource analyses encompass the entire DOE site, since analyses include the possibility of locating the MPF anywhere within each DOE site.

F.7.2 Description of Impact Assessment

The analyses of potential impacts to cultural and paleontological resources are very similar because the two types of resources can be affected by the alternatives in much the same manner. The analyses address potential direct and indirect impacts at each candidate site from construction activities and operation of the facility. Most potential impacts are those resulting from groundbreaking activities; however, other types of impacts are considered, such as reduced access by practitioners to resources, introduction of visual, audible, or atmospheric elements out of character with the resources, and increased visitation to sensitive areas. Analyses of impacts take into consideration the location of the reference site, the acreage required for the proposed facility, and the likelihood of resources being located in that area.

F.8 SOCIOECONOMICS

The analysis of socioeconomics will describe impacts on local and regional socioeconomic conditions and factors including employment, economy, population, housing and community services at each alternative site considered in the MPF EIS. The potential for socioeconomic impacts is greatest in those local jurisdictions immediately adjacent to each site and those that are potential residential locations for future DOE site employees at a new or expanded MPF.

Therefore, potential socioeconomic impacts are assessed using a geographic ROI. ROIs are used to assess potential effects on the economy as well as effects that are more localized in political jurisdiction surrounding the sites.

Region of Influence

The ROI for each site encompasses an area that involves trade among and between regional industrial and service sectors. It is characterized by strong economic linkages between the communities located in the region. These linkages determine the nature and magnitude of multiplier effects on economic activity (i.e., purchases, earnings, and employment) at each candidate site.

The U.S. Bureau of Economic Analysis measures multiplier effects of inter-industry linkages with the Regional Input-Output Modeling System (RIMS II). RIMS II is based on an accounting framework called an input-output table. An input-output table shows, for each industry, industrial distributions of input purchased and outputs sold. RIMS II Total Direct-Effect Multipliers will be used in the MPF EIS to estimate additional regional employment and income generated by employment and income directly associated with the Proposed Action.

Additional potential demographic impacts will be assessed on the area where the housing market and community services would be most affected. The ROI is defined as those counties where approximately 90 percent of the current DOE and contractor employees reside. This residential distribution reflects existing commuting patterns and attractiveness of area communities for people employed at each site, and is used to estimate the future distribution of direct workers with the Proposed Action. The evaluation of impacts is based on the degree to which changes in employment and population affect the regional economy, housing market, and community services. It is assumed that most new jobs would occur within the ROI where the majority of DOE and contractor employees live.

F.9 HUMAN HEALTH AND SAFETY

F.9.1 Occupational Radiation Health

F.9.1.1 Description of Affected Resources and Region of Influence

Potential impacts to human health and safety posed by the MPF include radiological and nonradiological exposure pathways and occupational injuries, illnesses, and fatalities resulting from construction activities and normal (accident-free) operations of the completed facility. Exposures pathways include inhalation, immersion, ingestion, and exposure to external sources. Occupational regions of influence include involved and uninvolved workers. Non-occupational ROIs for the public include the MEI and the general population surrounding the candidate sites.

F.9.1.2 Description of Impact Assessment

Occupational Radiation Health

Radiological impacts will be assessed for workers (both involved and non-involved in MPF operations) and for the public (MEI and population). Health impacts to involved workers from

MPF operations will be based on either information from MPF specific technology data reports or from similar (radiation) workers at the alternative sites. It is expected that the same dose will be applied to involved workers at each alternative site and, therefore, that this will not be a discriminator among sites (although it may be compared to the No Action Alternative).

Health impacts to non-involved workers will be based on doses calculated by the radiological air analyses. Doses will be converted to health effects (fatal cancer risk) using the multiplier of 400 fatal cancers per 10^6 person-rem. A 40-hour, 50-week worker exposure will be assumed.

Similarly, health impacts to the MEI and population will be based on doses calculated by the radiological air analyses. In this case, 500 fatal cancers per 10^6 person-rem will be used in order to reflect the more diverse population with respect to age and health (as opposed to workers). Continuous exposure over the year will be assumed. Furthermore, while inhalation and immersion will be the pathways of interest for workers, the general population may also be exposed through food pathways. Radiological impacts to drinking water, as assessed by hydrological analyses, will be included.

Occupational Safety

Occupational injury, illness, and fatality estimates will be evaluated using occupational incidence rates of major industry groups, DOE, and DOE contractors. When site-specific evaluations are performed, DOE Computerized Accident/Incident Reporting System (CAIRS) data will be used. Since activities similar to MPF operations or facility construction are not being performed at all of the potential MPF sites, U.S. Department of Labor, Bureau of Labor Statistics injury, illness and fatality information for similar activities will be used to determine bounding rates. These rates will be compared to person-hour estimates for the project. Occupational injury, illness, and fatality categories used in this analysis will be in accordance with OSHA definitions. Incident rates will be developed for facility construction and facility operations.

Health risks from hazardous chemical releases during normal operation at the respective DOE sites will be assessed by evaluating facility chemical source term inventories and engineered facility safety features used to mitigate personnel exposures during normal (accident-free) operations. HI values will be used to screen for additional analysis. If required, site boundary concentrations, derived through modeling (i.e., ISCST or equivalent) will be used to develop HQs for noncancer risks for comparison to reference concentration values, such as the EPA Integrated Risk Information System. The cancer risk to the MEI will be calculated from the doses derived from modeling exposure levels, using slope factors or unit risks for individual chemicals published in the Integrated Risk Information System or the health effects summary tables. The health effects summary tables are the yearly summary of EPA's regulatory toxicity data.

The HIs and cancer risks are used to identify potential health concerns that may require further analysis. If the HI and/or cancer risk exceed acceptable limits, then these sites or activities become candidates for further analysis. An in-depth analysis would identify the individual chemicals that contribute to substantial adverse HI and/or cancer risk impacts, starting with those chemicals showing the highest HQs and/or cancer risk and grouping them according to their specific health effects. These chemicals then may be identified for inclusion in more specific site

analyses. HIs and/or the cancer risk default values exceeding OSHA standards do not necessarily indicate that a health concern exists. The calculated HIs and cancer risk only establish a baseline for comparison of alternatives among different sites. The baseline is then used to determine the extent to which each alternative adds or subtracts from the No Action Alternative HI and cancer risk to the public at each site.

F.10 ACCIDENT ANALYSIS

F.10.1 Description of Affected Resources and Region of Influence

Potential impacts to human health and safety from postulated MPF accidents include radiological and nonradiological exposures. For both radiological and chemical accidents associated with the MPF, the affected resources are the facility and site workers and the offsite population. Specifically, for radiological accidents, the impact is incremental adverse health effects (i.e., latent cancer fatalities [LCFs]) for a non-involved worker, the maximally exposed offsite individual, and the offsite population within 80 kilometers (km) (50 miles [mi]) of each alternative site. In addition, a qualitative assessment will be made of the potential adverse health effects to workers in the MPF. For nonradiological accidents, airborne concentrations and potential health effects will be calculated for the non-involved worker and the maximally exposed offsite individual.

F.10.2 Description of Impact Assessment

Postulated accidents can be initiated by internal operations (e.g., fire, spill, criticality), external events (e.g., airplane crash), or natural phenomena (e.g., earthquake, flood). The MPF EIS will address a spectrum of unmitigated accident scenarios chosen to reflect the range and kinds of accidents that are postulated. The range of accidents is from low frequency-high consequence to high frequency-low consequence events in order to envelop potential risks. Accidents with estimated initiating event frequencies less than 10^{-7} per year will not be considered, unless their exclusion would affect decisionmaking. The spectrum of accidents and their calculated impacts should provide a baseline for each site that can be used to judge the environmental implications at alternative sites. The accident analysis will be performed in accordance with the *Recommendations for Analyzing Accidents Under the National Environmental Policy Act* (July 2002).

For radiological accidents, point estimates of radiation dose and, for the offsite population, corresponding incremental LCFs will be calculated for a hypothetical non-involved worker (located 1,000 m [3,281 ft] from the MPF release point), the maximally exposed offsite individual, and the offsite population within 80 km (50 mi) of each alternative site. For nonradiological accidents, estimates of airborne concentrations of chemical substances will be calculated for a hypothetical non-involved worker and the maximally exposed offsite individual.

It should be noted that the purpose of this EIS is to assist the decisionmaker in making site selection decisions. Since the activities at the MPF would be the same regardless of location, the risk to involved workers would be independent of site location and would not be a discriminating factor for programmatic siting decisions. Risks to involved workers may be addressed in greater detail in site-specific tiered NEPA documents if more detailed information is available.

For radiological and chemical accidents, the following general analytical steps will be followed:

1. Screen operations within the MPF to identify those with the potential to contribute to offsite risk.
2. Identify and screen postulated accident scenarios associated with those operations.
3. Calculate source terms (release rates and frequencies) for these unmitigated scenarios.
4. Calculate the onsite and offsite consequences (impacts to the health and safety of site workers and the general public) of these scenarios as follows.

The unmitigated consequences of accidental releases of radioactivity will be calculated using the MELCOR Accident Consequence Code System Version 2 (MACCS2) with the radiological source term values described above. In addition to the source term data, the following input data for the MACCS2 code will be obtained:

- Estimated location of specific MPF facilities and their distance from the site boundary
- Release heights (i.e., stack release, building release, or ground level release)
- Local meteorological conditions
- Offsite population distribution (using the 2000 census data)
- Offsite agricultural and economic data

The consequences of accidental releases of hazardous chemicals will be calculated using the Aerial Location of Hazardous Atmospheres (ALOHA) code with the chemical source term values described above. In addition to the source term data, input data for the ALOHA code is similar to that required for the radiological accident analysis, with the exception that offsite agricultural and economic data are not required.

For accident scenarios involving multiple operations within the MPF, such as those that might be caused by natural phenomena, estimates of radiation dose and corresponding incremental LCFs and estimates of airborne concentrations of chemical substances will be calculated for the same receptors as described previously.

F.11 ENVIRONMENTAL JUSTICE

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, signed by President Clinton in February 1994, requires each Federal agency to formulate a strategy for addressing environmental issues in human health- and environment-related programs, policies, planning and public participation processes, enforcement, and rulemaking. The White House memorandum accompanying the Executive Order directs Federal agencies to "analyze the environmental effects…of Federal actions, including effects on minority communities and low income communities when such analysis is required by NEPA."

Any disproportionately high and adverse human health effects on minority populations or low-income populations that could result from siting the MPF at any of the proposed alternative sites will be analyzed. The minority population and low-income population composition of the area surrounding the proposed alternative sites will be compared to that of a larger geographic area to determine whether the possible impacts of siting the MPF at a particular site will have a disproportionately high and adverse impact on minority or low-income populations.

F.12 TRAFFIC AND TRANSPORTATION

F.12.1 Description of Affected Resources and Region of Influence

Transportation routes in the vicinity of the proposed MPF location will be identified, in text and on a map, to indicate which highways would be impacted by MPF traffic, including commuters and shipments. Where available, traffic data, such as annual average daily traffic, will be presented as a baseline for a subsequent qualitative analysis of increased traffic congestion. Traffic data will be derived from recent DOE environmental documentation or from state agencies.

F.12.2 Description of Impact Assessment

The MPF EIS is programmatic in scope and will be used to support site selection and operation capacity. A tiered EIS on construction and operation will examine impacts at the selected site. Accordingly, the range of potential analytical endpoints for this siting EIS will be been reduced to those necessary to provide discrimination among the sites and operation alternatives. The full range of analytical endpoints will be reconsidered in the tiered EIS for construction and operation. The shipments under consideration would be limited to product inputs/outputs and waste associated with pit processing.

Incident-Free Transportation Impacts

Using the TRAGIS code, routes and routing characteristics will be determined for the origin-destination pairs associated with each of the alternative sites. Worker and population collective dose and latent cancer fatalities will be calculated using the RADTRAN 5 code. Results will be presented on an annual basis.

Transportation Accident Impacts

Using the RADTRAN 5 code, the total annual risk for each of the shipment campaigns (product and waste) will be calculated and analyzed for incident-free impacts.

Traffic Impacts

Traffic flow will be analyzed to determine whether or not the flow would be adversely impacted by the addition of new commuters for the MPF at each of the potential sites for both construction and operations phases. The number of new commuters will be determined based on construction and operations employment. If the data support a level of service (LOS) calculation, then changes in LOS will be calculated for each site. If LOS cannot be determined for all the sites, then semi-quantitative or qualitative arguments will be used with an attempt to rank the sites by

the result. Depending upon availability of data, a fraction of an increase in traffic at peak times could be an important indicator in lieu of LOS changes.

F.13 WASTE MANAGEMENT

F.13.1 Description of Affected Resources and Region of Influence

A key goal of the MPF project is to develop a safe, secure, environmentally compliant facility based on modern manufacturing procedures. Waste minimization will also be a goal of the MPF. The production of waste requiring offsite disposal will be reduced to as low as reasonably achievable (ALARA) consistent with cost-benefit analyses. The MPF siting alternatives would incorporate waste minimization and pollution prevention practices to the maximum extent practicable. Waste minimization efforts and the management of MPF-related wastes will be analyzed for each alternative site. The impact assessment will address the projected waste types and volumes from the MPF at each site compared to the No Action Alternative.

MPF construction wastes are similar to those generated by any construction project of comparable scale. Wastes generated during MPF operations would consist of five primary types: transuranic (TRU) waste, low-level waste (LLW), mixed LLW, hazardous waste, and nonhazardous waste. Waste management facilities supporting the MPF would treat and package the waste into forms that would enable long-term storage or disposal. The MPF would include the capability to process liquid TRU waste to a form suitable for disposal at Waste Isolation Pilot Plant (WIPP). Other waste types generated by the MPF would be transferred to existing facilities and managed in accordance with current practices at the DOE site.

F.13.2 Description of Impact Assessment

To provide a framework for addressing the impacts of waste management for the MPF, descriptive information will be presented on each site's waste management capabilities. The volumes of each waste type generated will be estimated. These estimates, obtained from the MPF data call, will include consideration of concepts for waste minimization. Impacts will be assessed in the context of existing site practices for treatment, storage, and disposal including the applicable regulatory requirements. Permits, compliance agreements, and other site-specific practices will be reviewed and analyzed to assess the ability to conduct the MPF-related waste management activities.

DOE generates both "routine" waste (e.g., job control, maintenance) and waste associated with environmental restoration (ER) and decontamination and decommissioning (D&D) activities. The ER/D&D waste volumes can vary greatly from year to year and often exceed the routine waste volumes. ER/D&D waste is fundamentally different (more volume, less contamination) from routine wastes and is frequently managed at separate facilities. The estimated waste volumes for MPF construction and operations will be compared to the routine waste generation at each site to identify potential impacts to the site's waste management infrastructure.

For all sites except WIPP, the number of additional shipments required to transport TRU waste to the WIPP will be estimated. The risks associated with additional TRU waste shipments will be addressed as part of the transportation impacts assessment.

For sites under consideration for the MPF that do not have existing or planned onsite LLW disposal, the number of additional shipments required to transport LLW from the site to a DOE LLW disposal facility will be estimated. For example, for purposes of this analysis, it will be assumed that the Pantex Plant would ship its LLW to the Nevada Test Site as per current practice. The risks associated with additional LLW shipments will be addressed as part of the transportation impacts assessment.

F.14 CUMULATIVE IMPACTS

The Council on Environmental Quality (CEQ) regulations implementing the NEPA define cumulative effects as "the impact on the environment which results from the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The regulations further explain "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." Other DOE programs and other Federal, state, and local development programs all have the potential to contribute to cumulative effects on DOE sites.

The methodology for the analysis of cumulative effects for the MPF EIS was developed from the guidelines and methodology in the CEQ's *Considering Cumulative Effects Under the National Environmental Policy Act*. The major components of the CEQ methodology include:

- Scoping, including identifying the significant potential cumulative effects issues associated with the proposed action, identifying the ROI and timeframe for the analysis, and identifying other actions affecting the resources
- Describing the affected environment
- Determining the environmental consequences, including the impacts from the proposed action and other activities in the ROI, and the magnitude and significance of the cumulative effects

The cumulative effects of the MPF EIS alternatives will be analyzed for each alternative site by reviewing and analyzing data from existing NEPA documents and other DOE documents. To update the data and to supplement this information, Internet searches, literature reviews of environmental documents for the regions surrounding the proposed sites, and personal contacts with local government planning departments will be undertaken, as needed, to obtain information on the potential cumulative effects for each resource area. For some resource areas, the analysis will include the cumulative regional impacts. For example, the air analysis must examine air quality in the region for each potential site in order to access the impacts of the proposed action.

Environmental impacts for other DOE programs and other Federal, state, and local development programs for each potential site will be reviewed and the cumulative impacts analyzed. The analysis will include impacts from previous actions at each of the sites and the region of influence, current actions, and actions planned for the future. These impacts, combined with the impacts from the MPF EIS, form the basis of the analysis of cumulative effects. Where possible, quantifiable data will be used. The level of analysis for each resource area will be commensurate to the importance of the potential cumulative impacts on that resource. The data and analysis is then summarized and potential cumulative impacts for each site identified.